United States Department of Agriculture

Marketing and Regulatory Programs

Agricultural Marketing Service

Specialty Crops Program

Specialty Crops Inspection Division

United States Standards for Determination of Fill Weights

Effective May 29, 1973

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This is a reprint of the United States Standards for Determination of Fill Weights which have been in effect since May 29, 1973 and were updated to modify the format and update obsolete contact information.

Voluntary U.S. grade standards are issued under the authority of the Agricultural Marketing Act of 1946, which provides for the development of official U.S. grades to designate different levels of quality. These grade standards are available for use by producers, suppliers, buyers, and consumers. As in the case of other standards for grades of fresh and processed fruits, vegetables, and specialty crops these standards are designed to facilitate orderly marketing by providing a convenient basis for buying and selling, for establishing quality control programs, and for determining loan values.

The U.S. grade standards and inspection instructions for all fresh and processed fruits, vegetables, and specialty crops are available on the internet and upon request at the address below. These documents provide detailed interpretations of the grade standards and provide step-by-step procedures for grading the product.

Grade standards are issued by the U.S. Department of Agriculture (USDA) after careful consideration of all data and views submitted during rulemaking. The Department welcomes suggestions for improving the standards in future revisions. Comments may be submitted to, and copies of standards and inspection instructions obtained from:

Director, Specialty Crops Inspection Division
Specialty Crops Program,
USDA, Agricultural Marketing Service
1400 Independence Avenue, SW, STOP 0240
Washington, D.C. 20250

Authority: 7 U.S.C. 1621-1627.

Note: Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, or with applicable State laws and regulations.

United States Standards for Determination of Fill Weights

General

§52.221 Purpose.

These proposed standards supplement the proposed U.S. Standards for Inspection by Variables so as to adapt them to the determination of fill of container, based on fill weights, for canned fruits vegetables, and related products.

§52.222 Explanation.

(a) The variables inspection standards may be used, where applicable, by any food processor for quality control purposes. Certification by the U.S. Department of Agriculture (USDA) of fill weights based on these standards, however, is applicable only under on-line inspection when a USDA inspector is present at time of packing and maintains appropriate records of the filling process.

(b) The procedure for determination and certification of fill of container, based on drained weights, may be used in the case of lot inspection as well as in-line inspection. This procedure, where applicable, is outlined in the U.S. standards for the respective products.

§52.223 Options.

The options of the median or conventional average may be used for determining compliance of fill weights with a specified minimum average fill weight.

§52.224 Type of specification and applicable limits.

(a) For the determination of fill weights, a low-sided specification applies.

(b) The specification limits, and values for such limits, are specified in those U.S. Standards for Grades of canned fruits, vegetables, and related products which incorporate the fill weight procedure. Suggested specification limits, and the values for such limits, for those products for which fill weights have been established—but are not yet incorporated in the USDA grade standards—may be obtained as supplements to these standards upon request to:

Director, Specialty Crops Inspection Division
Specialty Crops Program,
USDA, Agricultural Marketing Service
1400 Independence Avenue, SW, STOP 0240
Washington, D.C. 20250

(c) All of these limits, whether stated in the USDA grade standards or supplements hereof, are to be applied in accordance with the proposed U.S. Standards for Inspection by Variables.

Procedure

§52.225 Preparation of forms.

(a) Prepare the data sheet and control charts prior to the start of a processing period. Draw lines representing the $\overline{X}$'$_{min}$, LRL$\overline{x}$, and LRL values applicable for the product, container size, and style on the appropriate linear segment of the $\overline{X}$ chart in such a manner as to be clearly visible when posted in the plant. Lines representing LWL$\overline{x}$ and LWL may be drawn on the chart at the option of the user; however, all the values representing each limit ($\overline{X}$'$_{min}$, LWL$\overline{x}$, LRL$\overline{x}$, LWL and LRL) are placed on the $\overline{X}$ chart adjacent to the appropriate limit and identified (in brief form) as $\overline{X}$', WL$\overline{x}$, RL$\overline{x}$, WL, or RL accordingly).

(b) When the R chart is used, it is desirable to place it on lower portion of the control chart, using the bottom as zero, which is the lower limit for R.

(c) Space the limits for $\overline{R}$' and R_{max} on the appropriate linear segment above the zero line. The upper portion of the control chart is then used for the $\overline{X}$ chart.

(d) Attachment 1 is an example of an $\overline{X}$ and R data chart. Attachment 2 is an example of a control chart which combines the $\overline{X}$ chart and the R chart. However, use of the R chart is not required. The $\overline{X}$ chart illustrates the use of the median option as prescribed in the proposed U.S. Standards for Inspection by Variables. The dots plotted on the $\overline{X}$ chart represent the X values for the subgroup. The encircled dot represents the median of each subgroup. For easier identification the circle should be in a different color than the dots.

§52.226 Posting control charts.

It is desirable to post the control charts in such a place in the plant as to be clearly visible to the filler operator as well as other responsible plant personnel. The control charts serve as an aid to responsible plant personnel in controlling the filling process.

§52.227 Determination of tare of containers.

(a) General. Variations in the weight between individual empty containers (tare) must be taken into consideration when determining fill weights. These variations may be accounted for by procedure 1 or procedure 2 of this section.

(b) Procedure 1. Determine tare weights of each container size at least twice a week. In addition, determine tare weights whenever it is suspected that the present tare weight is no longer applicable. Some of the more common reasons for checking tare weights are changes in supply of containers, thickness of tin plate, and type of container.

(1) The number of empty containers taken at random from a given lot of containers to determine the average tare weight is as follows:

For containers equivalent to:

No. 2-1/2 containers and smaller----not less than 10 empty containers.
Larger than No. 2-1/2----------not less than 15 empty containers.

(c) Procedure 2. Preweigh a container (preferably stainless steel or other noncorrosive material) of suitable capacity and use this container as the standard tare. Drain the contents of the filled container as prescribed in §52.229 and transfer drained fruit or vegetable ingredient to the preweighed tare.

§52.228 Sampling.

(a) Subgroup size. Unless otherwise specified, the subgroup size shall be five sample units.

(1) The control chart values, except for $\overline{X}'_{min}$, will always be based on the specified subgroup size. When a subgroup size other than that specified is used, the values for the applicable limits must be changed accordingly.

(b) Time and point of sampling. The subgroups are drawn at a point in the process where no further change in the fill weight of the fruit or vegetable ingredient can occur.

(c) Sampling frequency. Unless otherwise specified, the sampling frequency for all canned fruits, vegetables, and related products, for which fill weights have been established shall be approximately every 45 minutes.

(1) The sampling frequency should be arranged to obtain subgroups at varying intervals and drawn in such a manner that the filler operators will not know when a subgroup will be drawn or which containers will be in the subgroup. This is important so that a nonbiased sample will be selected which will reflect the normal filling process.

§52.229 Measurements.

(a) Immediately after the subgroup has been drawn, invert each container on the hand or sieve and allow the product to drain until free from liquid, but in no case less than 10 seconds. In this step, do not remove the product from the container when procedure 1 as prescribed in §52.227 is used. The sample units are then weighed and the net weight of the fruit or vegetable ingredient (total weight minus tare weight) for each sample unit is recorded on the $\overline{X}$ and R data sheet.

(b) In the case of procedure 1 if it is suspected that the weight of individual empty containers deviate from the average tare weight to cause an individual

measurement to fall slightly below (or slightly above) LRL, the following procedure may be used:

(1) After the X value has been obtained as previously described, empty the contents of the suspected container and wipe it clean and dry.

(2) Weigh the suspected dry container. The amount of deviation is the difference between the weight of the individual container and the average tare weight.

(3) Adjust the suspected X value by the amount of deviation thus found.

(c) When adjustments for tare weight are made for individual measurements that fall slightly below LRL, adjustments must also be made for individual measurements that are slightly above LRL.

§52.230 Calculations and recording data.

(a) Immediately after the measurements have been obtained, the required calculations are made. All values are recorded to the nearest 0.1, rounding the values as follows:

(1) Drop any values less 0.050—

EXAMPLE:

$\overline{\overline{X}}$ calculated to be 18.743
Record $\overline{\overline{X}}$ as 18.7

(2) Increase any values to the next 0.1 when they are 0.050 or more—

EXAMPLE:

$\overline{\overline{X}}$ calculated to be 10.650
Record $\overline{\overline{X}}$ as 10.7

(b) After the required calculations are made and recorded, the appropriate values are plotted in accordance with the proposed U.S. Standards for Inspection by Variables.

Interpretations

§52.231 Interpretation of plotted values with respect to limits.

(a) Warning limits. The values representing LWL and LWL$\overline{x}$ are provided for the processor's benefit to use for control purposes. These limits are not to be confused with reject limits.

(1) An X value that falls between LWL and LRL or $\overline{X}$ value that falls between LWL$\overline{x}$ and LRL$\overline{x}$ may be expected occasionally, even when the process is still meeting requirements. This is the point, however, at which corrective action in the filling procedure may be taken.

(b) Code Segregation. The acceptance criteria specified in the proposed U.S. Standards for Inspection by Variables requires all X values to be equal to or above LRL for a low-sided specification and all Mi or $\overline{X}$ values to be equal to or above LRL$\overline{x}$.

(1) When an X, Mi, or $\overline{X}$ value(s) causes a code or distinctive mark to be rejected, the code or mark for the remainder of the shift may be changed to provide a chance for subsequent production for that shift to pass.

(c) Sampling Allowances. The sampling allowance code for each can size and style is specified in the grade standards which incorporate fill weights and the supplement to these standards for the applicable product. To determine the sampling allowance, first obtain the letter code for the appropriate container size and style from the table containing the fill weight values. Locate the line represented by this code on the sampling allowance chart accompanying the U.S. Standards for Inspection by Variables. This line represents the sampling allowance for the various sample sizes. Deduct this value from $\overline{X}'_{min}$. Do not add this value to $\overline{\overline{X}}$ or $\overline{\overline{M}}$i.

(1) The sampling allowance does not apply to a sample size of less than 10 sample units.

Optional Fill Weight Procedure for Small Lots

§52.232 Optional fill weight procedure for small lots.

(a) For lots consisting of 100 cases or less which require 4 hours or more to pack, the following minimum sampling rate and acceptance criteria may be used in lieu of the requirements and procedures outlined in the U.S. Standards for Inspection by Variables. The conventional average option must be used for this procedure. Do not use the sample median ($\overline{\overline{M}}$i).

(b) Draw a minimum of 15 sample units, one or two at a time throughout the entire production of the lot. The sampling intervals shall be such that the total sample will be representative of the lot.

(c) Accept the lot if:

(1) No X value is less than LRL.

(2) $\overline{\overline{X}}$ is equal to or greater than $\overline{X}'_{min}$ adjusted; and

(3) The condition under paragraph (d) (3) of this section does not exist.

(d) Reject the lot if:

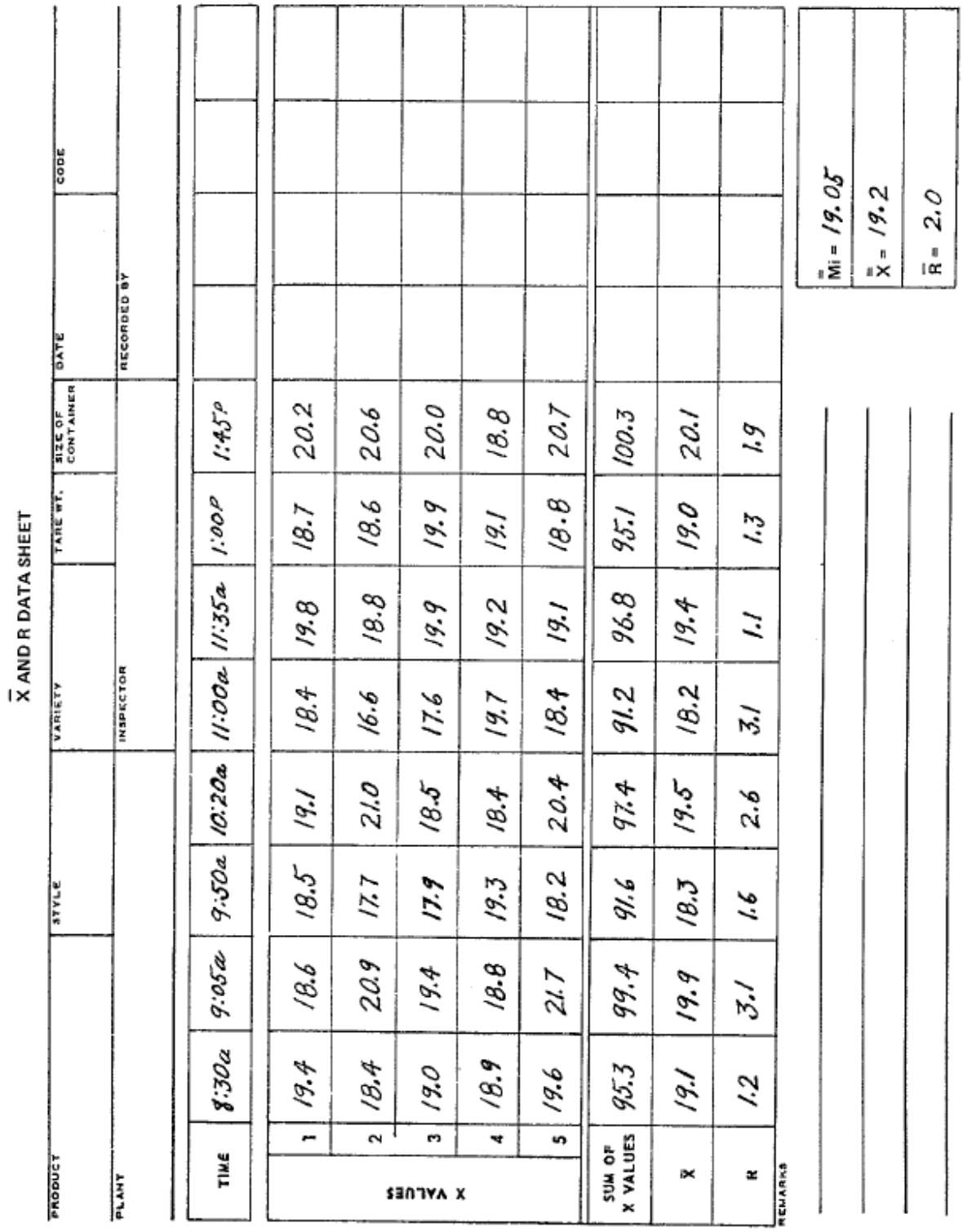
(1) $\overline{\overline{X}}$ is less than $\overline{X}'_{min}$ adjusted; or

(2) One or more X values are less than LRL; or

(3) All X values are less than $\overline{X}'_{min}$.

Attachments

Attachment 1—Sample $\overline{X}$ and R data sheets.



$\overline{X}$ AND R DATA SHEET

PRODUCT | STYLE | VARIETY | TARE WT. | SIZE OF CONTAINER | DATE | CODE

PLANT | INSPECTOR | RECORDED BY

	TIME	8:30a	9:05a	9:50a	10:20a	11:00a	11:35a	1:00P	1:45P			
X VALUES	1	19.4	18.6	18.5	19.1	18.4	19.8	18.7	20.2			
	2	18.4	20.9	17.7	21.0	16.6	18.8	18.6	20.6			
	3	19.0	19.4	17.9	18.5	17.6	19.9	19.9	20.0			
	4	18.9	18.8	19.3	18.4	19.7	19.2	19.1	18.8			
	5	19.6	21.7	18.2	20.4	18.4	19.1	18.8	20.7			
SUM OF X VALUES		95.3	99.4	91.6	97.4	91.2	96.8	95.1	100.3			
$\overline{X}$		19.1	19.9	18.3	19.5	18.2	19.4	19.0	20.1			
R		1.2	3.1	1.6	2.6	3.1	1.1	1.3	1.9			

REMARKS

$\overline{Mi}$ = 19.05

$\overline{\overline{X}}$ = 19.2

$\overline{R}$ = 2.0

Attachment 2—Sample control chart.